

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>2003B138</b>	<b>FOR FURTHER ACTION</b> see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. <b>PCT/EP2004/014479</b>	International filing date (day/month/year) <b>16/12/2004</b>	(Earliest) Priority Date (day/month/year) <b>18/12/2003</b>
Applicant <b>EXXONMOBIL CHEMICAL PATENTS INC.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

## 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box II).

3. ☐ **Unity of invention is lacking** (see Box III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. \_\_\_\_\_

☐ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

- b. ☐ none of the figures is to be published with the abstract.

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C07C29/141 C07C29/17 C07C45/50 C07C45/74 C07C11/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/114718 A1 (BUSCHKEN WILFRIED ET AL) 19 June 2003 (2003-06-19) cited in the application	1-12, 17, 30-36, 40-45
Y	paragraphs '0007!, '0008!, '0010!, '0011!, '0019! - '0027!, '0030! - '0033!, '0035!, '0037! - '0046!, '0049!, '0050!, '0054! examples & AU 97176 01 A (OXENO OLEFINCHEMIE GMBH) 20 June 2002 (2002-06-20)	13-16, 18-29, 37-39
Y	US 4 684 750 A (ZGORZELSKI WOLFGANG ET AL) 4 August 1987 (1987-08-04)	18-29
X	the whole document	44



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\* & \* document member of the same patent family

Date of the actual completion of the international search

29 April 2005

Date of mailing of the international search report

11/05/2005

Name and mailing address of the ISA

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Kardinal, S

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 02/094740 A (MCMATH SARAH ELIZABETH JANE ; ANDERSON KRIS (GB); GOODRICH PETER (GB);) 28 November 2002 (2002-11-28)	37-39
X	page 26 - page 27	44
Y	GB 643 503 A (N.V. DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ) 20 September 1950 (1950-09-20) page 3 - page 4; figure 3	13-16
A	US 5 324 420 A (DE MUNCK ET AL) 28 June 1994 (1994-06-28) cited in the application the whole document	1,42-45
A	GB 2 142 010 A (EXXON RESEARCH ENGINEERING CO) 9 January 1985 (1985-01-09) cited in the application	1
X		44

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/014479

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2003114718	A1	19-06-2003	DE 10062448 A1	20-06-2002
			AU 9717601 A	20-06-2002
			BR 0106122 A	13-08-2002
			CA 2364826 A1	14-06-2002
			CN 1358701 A	17-07-2002
			CZ 20014421 A3	17-07-2002
			EP 1219584 A2	03-07-2002
			HU 0105338 A2	28-12-2004
			JP 2002241329 A	28-08-2002
			MX PA01011619 A	26-06-2002
			NO 20016130 A	17-06-2002
			NZ 516068 A	31-05-2002
			SG 96251 A1	23-05-2003
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			HU 0105338 A2	28-12-2004
			JP 2002241329 A	28-08-2002
			MX PA01011619 A	26-06-2002
			NO 20016130 A	17-06-2002
			NZ 516068 A	31-05-2002
			SG 96251 A1	23-05-2003
			US 2003114718 A1	19-06-2003
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			AU 587748 B2	24-08-1989
			AU 6203486 A	05-03-1987
			BR 8604095 A	14-04-1987
			CA 1258873 A1	29-08-1989
			CS 8606140 A2	12-01-1989
			DE 3677864 D1	11-04-1991
			EP 0216151 A2	01-04-1987
			ES 2002724 A6	01-10-1988
			HR 940740 A1	30-06-1997
			HU 42045 A2	29-06-1987
			JP 1509566 C	26-07-1989
			JP 62051632 A	06-03-1987
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			KR 8903749 B1	04-10-1989
			RO 94395 A1	30-06-1988
			YU 147686 A1	29-02-1988
			ZA 8606387 A	29-04-1987
WO 02094740	A	28-11-2002	CA 2446835 A1	28-11-2002
			EP 1387819 A2	11-02-2004
			WO 02094740 A2	28-11-2002
			JP 2004533455 T	04-11-2004
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US 5324420	A	28-06-1994	GB 2246307 A	29-01-1992
			AU 663056 B2	28-09-1995

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/014479

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5324420	A	BR 9106700 A	08-06-1993
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		DE 69115492 D1	25-01-1996
		DE 69115492 T2	15-05-1996
		EP 0542794 A1	26-05-1993
		JP 3220140 B2	22-10-2001
		JP 6502392 T	17-03-1994
		KR 197450 B1	15-06-1999
		AT 131467 T	15-12-1995
		AU 8317091 A	02-03-1992
		WO 9202478 A1	20-02-1992
		MX 9100393 A1	28-02-1992
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GB 2142010	A	09-01-1985	NONE
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# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

To:

see form PCT/ISA/220

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/EP2004/014479

International filing date (day/month/year)  
16.12.2004

Priority date (day/month/year)  
18.12.2003

International Patent Classification (IPC) or both national classification and IPC  
C07C29/141, C07C29/17, C07C45/50, C07C45/74, C07C11/02

Applicant  
EXXONMOBIL CHEMICAL PATENTS INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

18 OCT 2005

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING  
AUTHORITY (SEPARATE SHEET)**

PCT/EP2004/014479

**1. Reference is made to the following documents :**

- D1: US 2003/114718 A1 (BUSCHKEN WILFRIED ET AL) 19 June 2003  
D2: US-A-4 684 750 (ZGORZELSKI WOLFGANG ET AL) 4 August 1987  
D3: WO 02/094740 A (MCMATH SARAH ELIZABETH JANE ; ANDERSON KRIS (GB); GOODRICH PETER (GB);) 28 November 2002  
D4: GB 643 503 A (N.V. DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ) 20 September 1950  
D5: US-A-5 324 420 (DE MUNCK ET AL) 28 June 1994

**2. Novelty and Inventive Step**

2.1 Document D1 discloses (cf. the passages indicated in the international search report) a process for the production of alcohols by hydroformylation and catalytic hydrogenation in the presence of water which is dissolved in the homogeneous liquid hydrogenation mixture such that no additional liquid water phase is present under reaction conditions. The process according to D1 aims to improve the yield in alcohol by hydrolysing by-products such as acetals, formates and aldol products and convert them into the target product.

In a preferred embodiment of the process according to D1 (cf. paragraph 46 and 49) a plurality of reactors is used in series while adding water before the individual reactors.

The features of dependent claims 3, 4, 8-10 and 30-36 are also disclosed in D1.

The subject-matter of claims 1, 3, 4, 8-10 and 30-36 is therefore not novel (Article 33(2) PCT).

2.2 The process according to claim 2 differs from the process of D1 in that water is added to the hydroformylation reactor and no water is added to the first hydrogenation reactor and is therefore novel (Article 33(2) PCT).

The problem to be solved has to be regarded as provision of an alternative process.

for the production of alcohols. It is however known from D1 (cf. paragraph 39) that the reaction mixtures of cobalt-catalysed hydroformylations include 0.5 to 5 wt. % of water and it seems obvious for the skilled person to reduce or leave out the addition of water to the first reactor if it is not necessary. The solution proposed in claim 2 of the present application cannot be regarded as involving an inventive step unless an unexpected technical effect or improvement can be shown.

2.3 The process according to claim 18 differs from the process of D1 in that an additional aldolisation step is performed prior to the hydrogenation. The aldolisation of hydroformylation products is a standard procedure to generate higher, branched products (cf. e. g. D2) and the skilled person would include such an aldolisations step in a process according to D1 if desired. The subject-matter of claim 18 can therefore not be considered as involving an inventive step (Article 33(3) PCT).

2.4 The use of ionic liquids in hydrogenation processes is known from D3. The hydroformylation in two reactors and the recycling of unreacted gases from the hydroformylation and the subsequent hydrogenation is known from D4. The removal of catalyst poisons, such as sulphur compounds, is described in D5.

It has to be regarded as belonging to the routine work of the skilled person to include these features into the aforementioned processes. Dependent claims 3-17 and 19-41 do not seem to contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step.

In view of the above, even if novelty could be established over the prior art, an inventive step could only be acknowledged if an unexpected technical effect or improvement can be shown, resulting directly from the technical differences which confer novelty over the prior art.

2.5 A specific degree of chemical purity of a low molecular compound does not constitute a new element imparting novelty to the claimed subject-matter. A document disclosing a low molecular compound makes this compound available to the public within the meaning of Art. 33 (2) PCT in all grades of purity as desired by a

person skilled in the art.

The document D1 discloses (cf. paragraph 33) several methyl heptenes and the mixture of isomeric C8-olefins obtained in the dimerisation of butene (dibutene). Such mixtures are generally predominantly branched. D1 furthermore discloses (cf. example 1) a mixture of C9 aldehydes, suitable for use as hydrogenation feed stream for the production of C9 alcohols.

The subject-matter of claims 42 to 45 is therefore not novel (Article 33(2) PCT).

It is furthermore generally known that chlorine and sulphur are potential catalyst poisons (cf. D5) and it is obvious for the skilled person to provide an olefin or aldehyde feedstock low in these contaminants in order to prolong the catalyst life if necessary.